REMARKS

Claims 1-15 are pending in this application. By this Amendment, claims 1, 3, 8 and 14 are amended. No new matter is added. Reconsideration of the application is respectfully requested.

Applicants gratefully appreciate the courtesies extended to Applicants' representative by Examiners Miller and Noori during the January 26, 2005 personal interview.

I. Rejections Under 35 U.S.C. §102(b)

A. Hollander

The Office Action rejects claims 1-7 under 35 U.S.C. §102(b) over U.S. Patent No. 3,145,563 to Hollander, Jr. ("Hollander"). Applicants respectfully traverse the rejection.

Hollander does not teach or suggest a force sensing element including "a current path and an electric output voltage path extending in a direction corresponding to the thickness direction of the semiconductor substrate is formed in the gauge portion," as recited in independent claims 1 and 3.

The Office Action asserts that Hollander teaches a force sensing element including a gauge portion 10 and a plurality of electrodes 16. Notwithstanding these assertions, Hollander does not teach or suggest a current path and an electric output voltage path extending in a direction corresponding to a thickness direction of a semiconductor substrate is formed in a gauge portion, as set forth in claims 1 and 3.

Hollander teaches a piezoresistive transducer including a slab 10 of single crystal p-type PbTe and centrally located electrodes 16, 18. See Fig. 1. Hollander also teaches a battery 30 supplying an input voltage to electrodes 16, and thus resulting in a voltage gradient in the direction indicated by arrow 15 in which the shear forces are applied. Fig. 1; col. 2, lines 45-47. Therefore, an electric current flows in the direction of arrow 15, i.e., a thickness direction which is the same direction that the shear forces are applied.

Although the application of shear forces produces changes in the resistivity of the slab 10, Hollander teaches that an output voltage E_{out} is measured across electrodes 18, i.e., in a direction different from the direction arrow 15. Fig. 1; col. 3, lines 3-9 and 16-22. Therefore, the measured output voltage E_{out} is in a different direction than the direction in which the shear forces are applied and in which the electric current flows. Accordingly, Hollander does not teach or suggest an electric output voltage path extending in a same direction in which shear forces are applied and electric current flows, as set forth in claims 1 and 3.

In the force sensing elements of claims 1 and 3, a constant current is applied to a force sensing element. See specification, paragraph [0048]. When a load is applied to a force transmission body and subsequently transmitted to an upper electrode of a sensing element portion, the load presses a gauge portion located between the upper electrode and a lower electrode. As a result, there is a resistance change in the gauge portion. Since the current is constant, the change in resistance results in a change in voltage. The change in voltage is measured along an electric voltage output path in the same direction, i.e., a thickness direction, that the load and the current are applied. Hollander does not teach or suggest these features as set forth in claims 1 and 3.

Therefore, claims 1 and 3 are patentable over Hollander. Claims 2 and 4-7 variously depend from claims 1 and 3, and thus also are patentable over Hollander for at least the reasons set forth above, as well as for the additional features they recite. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Rocha

The Office Action rejects claims 14 and 15 under 35 U.S.C. §102(b) over U.S. Patent No. 4,546,658 to Rocha et. al. ("Rocha"). Applicants respectfully traverse the rejection.

Rocha does not teach or suggest a force sensing element including that "the gauge portion has a piezoresistance effect," as recited in independent claim 14. The Office Action

asserts that Rocha teaches a force sensing element 10 comprising semiconductor substrates 11, 12, a gauge portion 14, and electrodes 16, 18. See Fig. 2. Notwithstanding these assertions, Rocha does not teach or suggest a gauge portion having a piezoresistance effect, as set forth in claim 14.

Rocha teaches a piezoelectric force/pressure sensor 10 including transducers 11, 12 having piezoelectric members 15, 15', and a coupling layer 14 provided between electrodes 16, 18. See Fig. 2. Although Rocha teaches applying a force F and a voltage causing deformation to the coupling layer 14, Rocha teaches that the piezoelectric force/pressure sensor 10 measures a piezoelectric effect produced in the coupling layer 14. See Fig. 2, and col. 4, lines 32-39. Accordingly, Rocha does not teach or suggest the force sensing element set forth in claim 14.

Therefore, claim 14 is patentable over Rocha. Claim 15 depends from claim 14, and thus also is patentable over Rocha. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. Rejection Under 35 U.S.C. §103(a)

The Office Action rejects claims 8-13 under 35 U.S.C. §103(a) over Hollander in view of U.S. Patent No. 4,144,474 to Datwyler, Jr. ("Datwyler"). Applicants respectfully traverse the rejection.

As discussed above, Hollander does not teach or suggest a force sensing element including "a current path and an electric output voltage path extending in a direction corresponding to the thickness direction of the semiconductor substrate is formed in the gauge portion," as recited in independent claim 8.

The Office Action admits that Hollander does not teach or suggest a force transmission block and a force transmission body support portion. However, the Office

Action asserts that Datwyler remedies such deficiencies of Hollander. However, Datwyler does not remedy the deficiencies of Hollander.

Datwyler, like Hollander, does not teach or a current path and an electric output voltage path extending in a direction corresponding to the thickness direction of the semiconductor substrate is formed in the gauge portion. Datwyler teaches a force transducer 10 including a piezoelectric crystal 12 mounted in a holder 14. See Fig. 4. Accordingly, Datwyler does not teach or suggest the force sensing element set forth in claim 8.

Contrary to the force sensing element of Hollander that measures a piezoresistive effect, the force transducer 10 of Datwyler teaches measuring a piezoelectric effect, i.e. a change in frequency produced in the crystal 12. See Abstract, and col. 5, line 3 - col. 6, line 6. Since piezoelectric transducers measure change in polarity and piezoresistive transducers measure change in resistance, neither Hollander nor Datwyler teaches or suggests any motivation to combine a piezoresistive and piezoelectric transducer. Such combination would render either type of transducer inoperable.

For at least these reasons, Hollander and Datwyler, alone or in combination, would not have rendered obvious the force sensing element of claim 8. Claims 9-13 depend from claim 8, and thus also would not have been rendered obvious by Hollander in view of Datwyler for at least the reasons set forth above, as well as for the additional features they recite. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

III. Conclusion

In view of the foregoing, Applicants respectfully submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-15 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

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